

Amendments to the Claims

The following listing of claims replaces all prior listings, and all prior versions, of claims in the application.

Listing of Claims

1. (original) An automatic liquid handling system comprising:
 - a dispensing tip container having a plurality of holding portions for holding dispensing tips;
 - a dispensing head having attachment portions to which at least one dispensing tip is attached, wherein when one or more dispensing tips are attached to the attachment portions, the dispensing head is capable of performing sucking and expelling operations for sucking liquid in or expelling the liquid out from the one or more dispensing tips;
 - a moving mechanism that moves the dispensing head;
 - a sensor that senses if one or more dispensing tips are attached to the attachment portions of the dispensing head when the head moves relative to the sensor, wherein the sensor has a sensing region that extends in a direction slanted with respect to a direction in which the dispensing head moves, and generates an output indicative of a status of the dispensing tips attached to the attachment portions of the dispensing head; and
 - a control device that controls the sucking and expelling operations performed by the dispensing head and controls the moving mechanism to control movements of the dispensing head.
2. (original) The automatic liquid handling system according to claim 1, wherein the sensor optically senses one or more dispensing tips.

3. (original) The automatic liquid handling system according to claim 2, wherein the sensor comprises a light emitting unit and a light receiving unit disposed apart a predetermined distance from the light emitting unit, a light path being formed between the light emitting unit and the light receiving unit, wherein the moving mechanism moves the dispensing head to traverse the light path.

4. (original) The automatic liquid handling system according to claim 1, further comprising a memory that stores information about a number of dispensing tips to be attached to the attachment portions of the dispensing head with position data indicating the holding portions to which the dispensing tips are to be attached, wherein the control device compares the output of the sensor with the information stored in the memory.

5. (original) The automatic liquid handling system according to claim 4, further comprising adjusting means for adjusting the number of dispensing tips attached to the attachment portions of the dispensing head and the attachment positions of the dispensing tips as indicated by the information stored in the memory when the control device generates a comparison result indicating that the output of the sensor and the information stored in the memory are not in coincidence with each other.

6. (original) The automatic liquid handling system according to claim 4, wherein when the control device generates a comparison result indicating that the output of the sensor and the information stored in the memory are not in coincidence with each other, the control device controls the moving mechanism to stop movement of the dispensing head.

7. (original) The automatic liquid handling system according to claim 6, wherein the control device generates the comparison result each time comparison is performed with respect to one attachment portion of the dispensing head.

8. (original) The automatic liquid handling system according to claim 6, wherein the control device generates the comparison result after comparison is performed with respect to all the attachment portions of the dispensing head.

9. (original) The automatic liquid handling system according to claim 3, wherein the moving mechanism moves the dispensing head in a three dimensional space defined by X-axis, Y-axis, and Z-axis, and swivels the dispensing head in a plane defined by the X-axis and the Y-axis, wherein the light emitting unit and the light receiving unit are disposed in the plane defined by the X-axis and the Y-axis in such a positional relationship that the light path forms 45 degrees with respect to the X-axis and the Y-axis, and the moving mechanism moves the dispensing head in a direction of the X-axis or the Y-axis to traverse the light path.

10. (new) The automatic liquid handling system according to claim 1, wherein the sensing region of the sensor includes a sensing axis that extends in the direction slanted with respect to the direction in which the dispensing head moves.

11. (new) The automatic liquid handling system according to claim 10, wherein the sensor is an optical sensor and the sensing axis is an optical sensing axis.

12. (new) The automatic liquid handling system according to claim 11, wherein the sensor comprises a light emitting unit and a light receiving unit disposed apart a predetermined distance from the light emitting unit, and a light path extending along the optical axis being formed between the light emitting unit and the light receiving unit, wherein the moving mechanism moves the dispensing head to traverse the optical axis of the light path in the slanted direction with respect to the direction in which the dispensing head moves.

13. (new) The automatic liquid handling system according to claim 3, wherein the slanted direction of the optical axis of the light path extends at about 45° angle with respect to the direction in which the dispensing head moves.

14. (new) The automatic liquid handling system according to claim 13, wherein the moving mechanism moves the dispensing head in a three dimensional space defined by X-axis, Y-axis, and Z-axis, wherein the light emitting unit and the light receiving unit are disposed in the plane defined by the X-axis and the Y-axis in such a positional relationship that the optical axis of the light path forms the slanted direction of about the 45° angle with respect to the movement of the dispensing head in the direction of the X-axis or the Y-axis.

15. (new) An automatic liquid handling system comprising:
a dispensing tip container having a plurality of holding portions for holding dispensing tips;
a dispensing head having attachment portions to which at least one dispensing tip is attached, wherein when one or more dispensing tips are

attached to the attachment portions, the dispensing head is capable of performing sucking and expelling operations for sucking liquid in or expelling the liquid out from the one or more dispensing tips;

a moving mechanism that moves the dispensing head;

a sensor that senses if one or more dispensing tips are attached to the attachment portions of the dispensing head when the head moves relative to the sensor, wherein the sensor comprises a light emitting unit and a light receiving unit disposed apart a predetermined distance from the light emitting unit, a light path being formed between the light emitting unit and the light receiving unit, wherein the moving mechanism moves the dispensing head to traverse the light path; and

a control device that controls the sucking and expelling operations performed by the dispensing head and controls the moving mechanism to control movements of the dispensing head.

16. (new) The automatic liquid handling system according to claim 15, wherein the control device performs a comparison based upon an output of the sensor and predetermined information and generates a comparison result each time comparison is performed with respect to one attachment portion of the dispensing head.

17. (new) The automatic liquid handling system according to claim 16, wherein the comparison results indicating abnormality are displayed after comparison is performed with respect to all of the attachment portions of the dispensing head.